REMARKS

By the present amendments, claims 1 and 4 have been amended. Claims 8-15 and 17 stand withdrawn from consideration and thus claims 1, 3-7, and 18-21 are currently under examination in the present application. For the reasons set forth below, Applicants submit that the present amendments and arguments place this application in condition for immediate allowance.

As an initial matter, the amendments to claims 1 and 4 are proper and do not add any new matter to the application. In particular, claim 1 has simply been amended to specify that the already recited polymerization process is a radical polymerization process, and to further include a free radical-generating polymerization initiator. Support for these amendments can be found, for example, at page 8, line 24 and page 10, line 11 of the application, respectively. Further, by the present amendments, claim 1 has been amended to clarify that the template material is removed from the final molecularly imprinted polymer product that is produced by the presently-claimed methods. Support for this amendment can be found, for example, on page 1, lines 15-18 of the application. Finally, claim 1 has also been amended to specify that the monomer is selected from vinyl, allyl, styrene, acrylic and methacrylic derivatives and mixtures thereof. These particular monomers were previously recited in claim 4, which has now been amended to remove the reference to the monomers. Accordingly, the amendments are in all cases supported by Applicants' specification.

In the Office Action dated October 24, 2008, the Examiner rejected claims 1, 3-7, and 18-21 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Application Publication No. 2003/0113234 ("Murray") and/or U.S. Patent No. 6,039,872 ("Wu") in combination with U.S. Patent No. 6,582,971 ("Singh"). In particular, the Examiner asserted that is would have been obvious to combine these references to make membranes with specific and complementary binding sites for binding analytes as taught by Singh. For the reasons set forth below, Applicants submit that this rejection is respectfully traversed and should be withdrawn.

The claims of the present application, as amended, are directed toward a method of producing a molecularly imprinted membrane, which is imprinted with a biological-type molecule. In these methods, and as recited in claim 1, as amended, monomers selected from vinyl, allyl, styrene, acrylic and methacrylic derivatives, and mixtures thereof are polymerized by radical polymerization in the presence of a template. The template, which is removed following the polymerization of the monomers, directs positioning of the functional monomers during polymerization and creates imprints in the resulting polymer. By using these specific functional monomers in conjunction with a template, the presently-claimed methods thus allow for the production of a highly cross-linked, molecularly imprinted polymer. Further, the use of a plasticizer and other conditions for producing pores of defined sizes leads to a useful membrane in which large pores may be produced to permit high fluxes and smaller pores may be produced to generate a high surface area and lead to improved mass exchange properties.

In contrast to the present application, the products of Murray are not molecularly imprinted polymers. Although Murray describes polymerizing a mixture that includes an iron vinyl benzoate cation as an imprinting complex, this complex can not be regarded as a template as it is not removed from the product of Murray following polymerization. Instead, as depicted in Figs. 1a and 1b of Murray, the majority of this complex becomes part of the polymer and only the ferric cation is removed. This ferric cation, however, cannot be equated with a template either as the polymerization process does not create an imprinted cavity for this ion. The binding site of the ion is already present in the iron vinyl benzoate complex and thus no imprinted cavity is being created during the polymerization process.

With regard to the cited Wu reference, Wu merely describes forming a membrane from a polymer that has both hydrophilic and hydrophobic components. In Wu, the polymer is formed from a reaction mixture containing a preformed hydrophobic polymer, such as polysulfone or polyethersulfone, and a hydrophilic polyalkylene diacrylate. Although Wu suggests that the mixture may also include a pore former, the membrane that is produced by Wu is specifically described as having a pore rating from about 0.02 μm to about 10 μm (i.e., 20-10,000 nm). As such, there is no teaching or suggestion in Wu of a material that has a range of pore sizes extending from under 100 nm to greater than 500 nm, as described and claimed in the present application. Furthermore, there is no teaching or suggestion at all in Wu that the membrane should comprise a molecularly imprinted polymer. Instead, the disclosure of Wu is primarily directed at providing improved filtration media.

With regard to the cited Singh reference, Singh describes a very specific technique of interfacial polymerization that involves organic and aqueous phases, with a host polymer dissolved in one phase, and a monomer and a "print molecule" dissolved in the other phase to achieve the interfacial polymerization. The only monomer that is described for use in Singh, however, is pyrrole, and Singh only includes a brief mention of the use of plasticizers to impart flexibility without further exemplifying the use of these plasticizers in a particular phase. Singh also includes a brief mention of porosity. However, Singh only refers to the choice of a solvent as playing a role in determining the porosity of the composite, and does not teach or suggest the use of a separate porogen as recited in claim 1 of the present application, much less teach or suggest the production of a membrane with pores ranging in size from less than 100 nm to greater than 500 nm.

In light of the foregoing comments, it is thus the case that there is no apparent reason, nor has the Examiner provided one, for a person of ordinary skill in the art to combine the membranes of Murray and/or Wu with the interfacial polymerization system of Singh, much less to do so in a manner that would produce the claimed invention. Indeed, given the vast differences between these cited references, Applicants fail to see how a person of ordinary skill in the art would "be able to fit the teachings of [these references] together like pieces of a puzzle," as suggested by the Examiner.

With regard to the Examiner's proposed combination of the Murray and Singh references, these two references describe very different systems that simply could not be combined with one another. For example, Murray is specifically concerned with materials that are capable of binding ions and, thus, there is no teaching or suggestion as

to how a biological molecule, such as those described by Singh, could be substituted for an ion. Murray teaches that its polymer is formed by incorporating an "ion imprinting complex" that has a shell which becomes incorporated into the polymer, and an ion that is removably engaged in the shell. As such, there is no teaching or suggestion whatsoever regarding what a biological imprinting complex might be, or how such a complex would be produced or used in the membrane of Murray.

Furthermore, one of ordinary skill in the art would not expect that the ion materials of Murray could even be used with interfacial polymerization system taught by Singh. Singh uses ferric ions to induce polymerization, whereas Murray teaches that the ferric ions comprise a portion of the "template." Consequently, even if one were motivated to combine the Murray and Singh references, such a combination would be inherently unstable.

With regard to the proposed combination of the Wu and Singh references, as discussed above, Singh is essentially concerned with an interfacial polymerization technique that involves an aqueous layer containing a template or "print molecule" and a monomer, and an organic phase containing a host polymer. As shown in Fig. 6 of Singh, the product thus has discrete regions of two different polymers (e.g. polypyrrole and PMMA) that arise from the two different phases. In contrast to that system, Wu is directed toward a homogenous system which produces a product in which two polymers are integrated in an interpenetrating polymeric network. Given the differences between these two systems, there is thus no apparent reason to combine these two references, nor is there any teaching or suggestion in the references themselves as to how two different

techniques for producing two different systems could be combined. Further, given the differences between the systems of Wu and Singh, it is thus the case that one of ordinary skill in the art would also not expect that these two incompatible systems could be combined with a third system, such as the one taught by Murray, which is also quite different and incompatible with the systems of Wu and Singh.

Finally, even assuming, *arguendo*, that one of ordinary skill in the art would combine the Murray and/or Wu references with the teaching of Singh, such a combination would still fail to result in an invention as recited in the claims of the present application. In particular, claim 1 recites the step of selecting the porogen and polymerization conditions such that the membrane contains pores ranging in size from less than 100 nm to greater than 500 nm. Neither Murray, Wu, nor Singh teaches or suggests the selection of conditions to produce a range of pore sizes of less than 100 nm to greater than 500 nm within a single membrane.

Accordingly, Applicants respectfully submit that the present invention is not rendered obvious by the cited references, and that the claims of the present application relating to a method for synthesizing substrate-selective membranes with pores ranging in size from less than 100 nm to greater than 500 nm are clearly patentable over those references. Applicants thus submit that the Examiner's rejection on the basis of the cited references is respectfully traversed and should be withdrawn.

In light of the amendments and arguments provided herewith, Applicants submit that the present application overcomes all prior rejections and objections, and has been placed in condition for immediate allowance. Such action is respectfully requested.

Respectfully submitted,

Date: April 24, 2009

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